

## GEARBOX ACTUATOR COMPRISING A BEARING FOR THE GEARSHIFT RAILS

### CROSS-REFERENCE TO RELATED APPLICATIONS

**[0001]** This application is filed under 35 U.S.C. §120 and §365(c) as a continuation of International Patent Application PCT/DE03/01195, filed April 10, 2003, which application is incorporated herein by reference. This application also claims priority of German Patent Applications 102 15 715.4, filed April 10, 2002 and 102 41 068.2, filed September 5, 2002, which applications are incorporated herein by reference.

### BACKGROUND OF THE INVENTION

**[0002]** This invention relates to a gearbox actuator with a selector shaft, arranged in a housing and driven by a drive upon which are attached a shift finger and disengaging shaped elements that operate the gearshift rails.

**[0003]** Usually, the gearshift rails of a gearbox actuator are made of sheet metal and are placed in bearings on both their ends. One problem consists in the following - in case of larger or longer gears, the gearshift rails are subjected to a relatively softly bending bearing.

### OBJECT OF THE INVENTION

**[0004]** The object of this invention is to design a gearbox actuator such that the gearshift rails will be positioned relatively resistant to bending.

### BRIEF SUMMARY OF THE INVENTION

**[0005]** This problem is solved by a gearbox actuator with a selector shaft that is driven by a drive and that is arranged in a housing upon which are attached a shift finger and disengaging shaped elements that operate the gearshift rails, whereby, arranged on the housing, is a bearing arrangement that supports and guides the gearshift rails between it.

**[0006]** The essential advantage of the invention consists in the following: By means of an additional bearing or bearing arrangement of the gearbox actuator, the gearshift rails can be preferably supported in the middle so that they will be positioned in a relatively bending resistant manner. This is why one can prevent undesirable and damaging shifts of the gearshift rails, such that they can be caused by vibrations and impacts.

**[0007]** The bearing arrangement is designed in a particularly simple and advantageous manner by jibs arranged on the housing that support and guide the gearshift rails between them.

**[0008]** In a particularly preferred manner, the housing of the gearbox actuator comprises an attachment part by means of which it can be attached on a gearbox housing of a gearbox in such a way that the jibs protrude through an opening or recess in the gearbox housing into said housing in order to be able to receive the gearshift rails. The attachment part and the jibs in a practical manner have the shape of an injection-molding part.

**[0009]** To support and guide the gearshift rails in a particularly effective manner, one of the embodiments of the invention features two upper jibs and two lower jibs that are opposite each other with respect to the selector shaft. Only two jibs are provided in a preferred manner in a simpler embodiment. The four or two jibs are placed preferably symmetrically opposite each other with respect to the selector shaft.

**[0010]** To facilitate a particularly frictionless and also relatively wear-resistant engagement of the jibs on the slide rails, the jibs preferably have guide shoe parts on the terminal areas that rest against the gearshift rails.

#### BRIEF DESCRIPTION OF THE DRAWINGS

**[0011]** The invention and its embodiments will be explained in greater detail below in conjunction with the figures, wherein:

Figure 1 is a three-dimensional illustration of a gearbox actuator;

Figure 2 is an exploded view of the gearbox actuator in Figure 1; and

Figure 3 is a development of the invention.

#### DETAILED DESCRIPTION OF THE INVENTION

**[0012]** Gearbox actuator **1** in the known manner comprises a central selector shaft **2** that is positioned in bearing parts **19** and that, for example, in the middle, has a shift finger **3** and two disengaging shaped elements **4, 4** that are arranged at an interval corresponding to the width of one gap width. Selector switch **2** is preferably driven by a brushless motor **5** via a double planetary stage **6** and a toothed segment **7** that preferably engages a toothed wheel **16** that is positioned in a housing part **17**. A preferably second brushless motor **8** via a spindle **9** drives a sliding element **37** that shifts the shift finger **3** and the disengaging shaped elements **4, 4** on selector shaft **2**. The structure of this known gearbox actuator **1** can be seen particularly clearly in the exploded view shown in Figure 2.

**[0013]** In Figures 1 and 2, the housing of gearbox actuator **1** is labeled **10**. It has a preferably plate-shaped or flange-shaped attachment part **11** with which it is attached upon a gear (not shown). Housing **10** has a bearing arrangement for the gearshift rails that preferably comprises two upper jibs **12, 13** as well as two lower jibs **14, 15** that preferably protrude from attachment part **11** into the gear and that between themselves guide and support the packet of gearshift rails. Preferably, the upper and lower jibs **12, 13, 14, 15** are symmetrically opposite each other with respect to the selector shaft **2**. It is also conceivable that one would provide only two jibs in a simplified embodiment of the invention in place of the previously explained four jibs. In a particularly preferred manner, housing **10**, attachment part **11**, bearings **19** and jibs **12** to **15** involve an injection-molding part that can possibly also comprise the housing part **17**.

According to a development of the invention, guide shoe parts can be arranged at the ends of jibs **12** to **15** on the contact surfaces toward the gearshift rails, which guide shoe parts preferably are made of plastic and can be clipped on. Such a guide shoe part is illustrated in the form of a diagram in Figure 2 and is labeled **38**.

**[0014]** Figure 3 shows a development of the invention where an additional support for gearshift rails **26, 27, 28** is arranged on a housing of a gearbox actuator **30** in order to diminish or prevent shifts of the gearshift rails **26, 27, 28** that can be traced back to vibrations and impacts. An advantageous feature is represented here by the fact that the additional support does not make the construction of the housing any more complicated.

**[0015]** In Figure 3, the gearbox housing of the gear, preferably a double clutch gear, is labeled **31**. After it has been assembled, gearbox actuator **30** is placed upon gearbox housing **31** and is attached upon it, i.e., it is screwed together with it. On its side facing toward the gearbox housing, gearbox actuator **30** has at least two supporting rails or jibs **32, 33** for support purposes, which support rails or jibs, preferably starting from a flange or attachment part **29** with which the gearbox actuator **30** is attached upon the gearbox housing **31**, protrude through an opening **35** of same into the interior of the gearbox housing **31**. Between them, these jibs **32, 33** receive the packet of gearshift rails **26, 27, 28** that are connected with gearshift forks **36, 37**.

**[0016]** During the shifting process, the gearshift rails **26, 27, 28** are guided and supported between jibs **32, 33**. As the gearbox actuator **30** is attached upon gear housing **31**, the additional jibs **32, 33** do not represent any impairments because they are simply inserted through the opening **35** of the gear housing **31** in order between them to receive gearshift rails **26, 27** and **28**.

**[0017]** The patent claims submitted with the application are formulation proposals without regard to the attainment of additional patent protection. Applicant reserves the right to

claim additional feature combinations that are so far disclosed only in the description and/or drawings.

**[0018]** References, used in the subclaims, point to the additional development of the object of the main claim by means of the features of the particular subclaim; they are not to be understood as a waiver of the attainment of an independent, objective protection for the feature combinations of the referenced subclaims.

**[0019]** The object of the subclaims can form separate and independent inventions with a view to the state of the art on the priority date; therefore, applicant reserves the right to make them into an object of independent claims or partial declarations. They can furthermore also contain independent inventions that display a design independent of the objects of the preceding subclaims.

**[0020]** The exemplary embodiments are not to be construed as a restriction of the invention. Instead, numerous changes and modifications are possible in the context of the disclosure on hand, especially those variants, elements and combinations and/or materials that, for example, by combination or modification of individual features or elements or process steps in conjunction with those described in the general description and embodiments as well as the claims and contained in the drawings, can be preferred by the expert with a view to the solution of the problem and that by means of features that can be combined lead to a new object or to new process steps or new process step sequences also to the extent that they relate to production, testing and working processes.